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PARASITIC FAUNA OF ARCTIC CHARR, *SALVELINUS ALPINUS* (L., 1758)  
FROM THE HORNSUND REGION (SPITSBERGEN)

PARAZYTOFAUNA GOLCA *SALVELINUS ALPINUS* (L., 1758)  
Z REJONU HORNSUNDU (SPITSBERGEN)

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Parasites found in 64 individuals of *Salvelinus alpinus* were identified. A total of 5 parasitic species belonging to 3 higher taxa were found. Plerocercoids of *Diphyllobothrium* sp. cestodes occurred between the peritoneal membrane and ventral muscles as well as in the stomach walls. Individuals of the cestode *Eubothrium salvelini* were found occurring in the stomach, intestine, and pyloric caeca. *Philonema* sp. nematodes occurred in gonads, on the peritoneum, and in the body cavity. The latter housed also another nematode which could not be identified. Females of the copepod *Salmincola edwardsii* were found on the gills. The data collected made it possible to determine the invasion incidence, intensity, mean intensity, and mean invasion intensity in population.

INTRODUCTION

Studies on Arctic biology are becoming more and more comprehensive each year as the region challenges specialists in diverse fields. Ichthyologists have only recently tackled the Arctic. The facilities existing there are, unfortunately, not adequate to carry out research on fish, which makes it difficult to collect the study material, preserve it and store. Detailed parasitologic examination is possible only after the fish have been brought to a scientist's home laboratory.

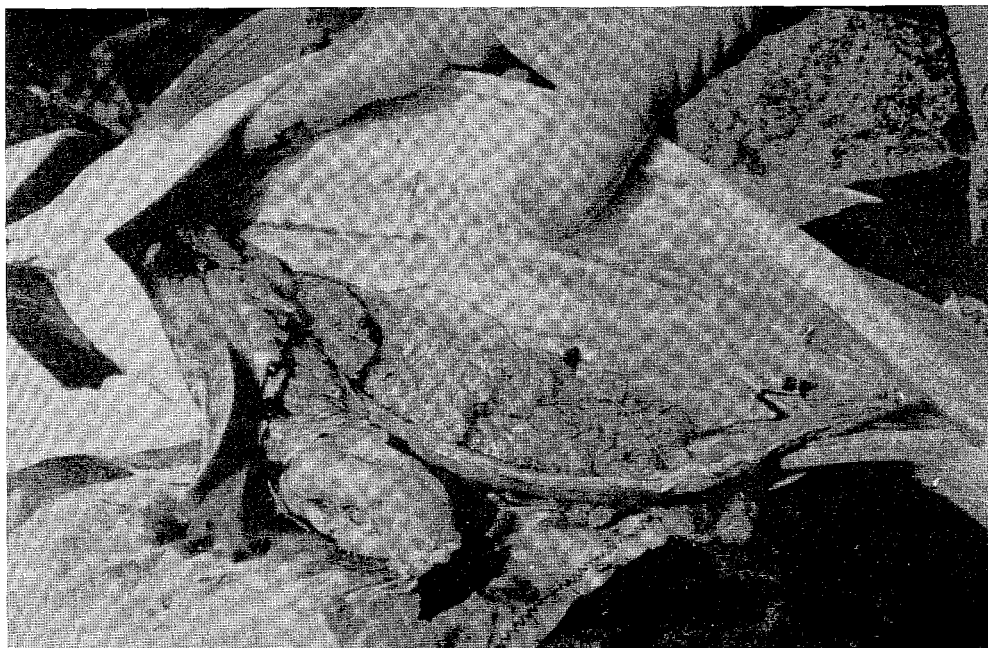


Fig. 1. Internal organs of non-infested *Salvelinus alpinus* (a freshly caught individual). Photo: K. Radziun

*Salvelinus alpinus* has a wide distribution range (Balon, 1980). Due to the geographic separation of the Spitsbergen stock, it seemed interesting to find out if the stock was also separated in terms of its parasitic fauna (Fig. 1). The use of parasites as biological tags is widely accepted (Kabata 1963).

Parasites of the Arctic charr were studied in different areas, from the Atlantic Ocean to Kamtchatka (Butorina, 1975; Dedis, 1940; Dick and Belosevic, 1981). However, the literature lacks data on the parasitic fauna of the Spitsbergen population of the species.

#### MATERIALS AND METHODS

A total of 64 individuals of *S. alpinus* were examined for parasites. In most cases, analyses were made on incomplete bodies or dissected body parts. The materials examined comprised: 7 carcasses of fish caught in River Revelva and 1 carcass of a specimen caught in Lake Revvatnet in 1985; 17 intestines preserved in 4% glutaraldehyde with 0.1 M sodium cacodylate buffer, dissected out from individuals caught in 1985, including 4 intestines from the carcasses mentioned above; 2 complete speci-

mens frozen whole after capture in River Revelva in 1985; 2 frozen specimens with their intestines dissected out and frozen separately, caught in Lake Revvatnet and River Revelva in 1986; 39 frozen individuals with viscera, but lacking skeletal muscles, caught in Lake Svartvatnet in 1986.

The fish were thawed and the following organs examined: eyes, nostrils, gills, heart, liver, kidney, gonads, gall bladder, stomach, intestine with pyloric caeca, muscles and skin. The skeletal and ventral muscles were thoroughly broken down before examination; contents of the stomachs, intestines, and pyloric caeca were isolated by decantation. The gills were examined with naked eye and under a stereomicroscope. Mounts were made of the material scraped off from gill lamellae and the suspension of the gill bladder content; the mounts were examined also under immersion.

The parasites found were preserved in various ways: nematodes were fixed in 5% formalin with physiological solution; cestodes, subject to slight flattening, were fixed with 75% alcohol, stained in alum carmine, dehydrated in ethyl alcohol, cleared with xylene and mounted in Canada balsam; crustaceans were fixed in 5% formalin and the appendages were cleared in the Berlese fluid.



Fig. 2. Internal organs of *S. alpinus* with visible cestode cysts on the stomach and peritoneum (a freshly caught individual). Photo: K. Radziun

## RESULTS

Examination of the carcasses of *S. alpinus* caught in 1985 revealed a cestode larva, encysted under the external peritoneum; the narrower part of the larva showed an outline of a groove. Similar cysts occurred between the peritoneum and ventral muscles as well as in the stomach walls of the fish caught in 1986 (Fig.2). A detailed examination of mounts and a comparison with the literature data allowed to conclude that the larvae found belonged to the genus *Diphyllbothrium* Cobbold, 1858 (Table 1). The long time of storage and exceptional morphological similarity of various plerocercoids made the species identification impossible.

All the intestines preserved in 4% glutaraldehyde (the fish caught in 1985) and most of the intestines of the Arctic charr caught in 1986 yielded numerous cestodes. From 1 to 132 cestodes were being found in the stomach, intestine and pyloric caeca. The cestodes were identified as *Eubothrium salvelini* Schrank, 1790 (Fig. 3).

The parasites found in the fish caught in 1986 included nematodes of the genus *Philonema* Kuitunen-Ekbaum, 1933. The nematodes, 3–30 mm long, occurred in the body cavity, on gonads, and on the internal peritoneal lamina.

A nematode found in the body cavity of one of the fishes differed in its morphology from the other nematodes described above. Due to its poor condition and its being a single specimen, no species identification could be made.

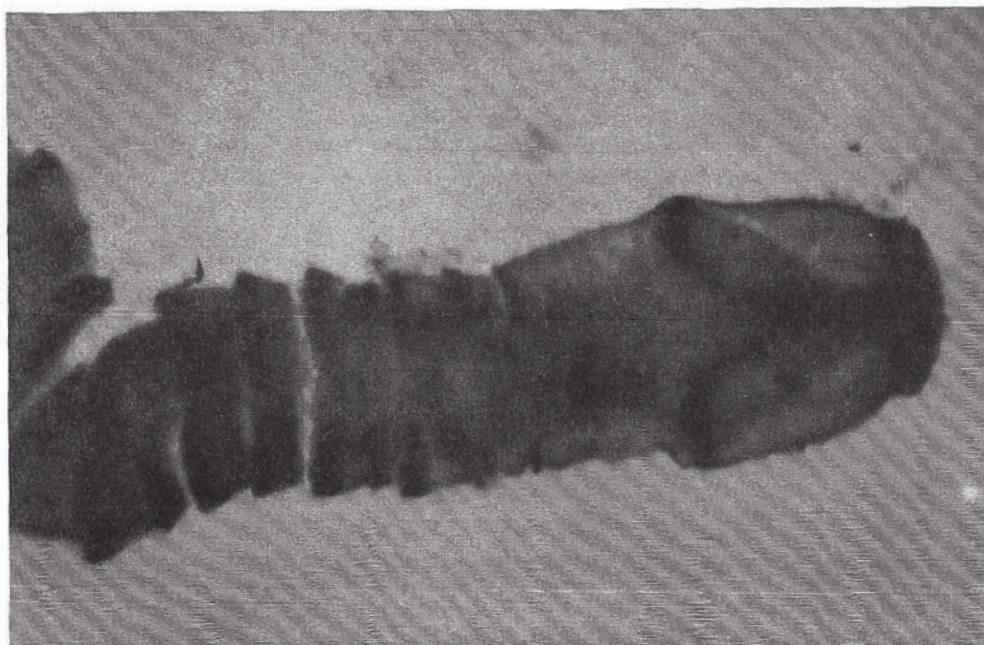


Fig. 3. *Eubothrium salvelini*: scolex, neck and part of the strobila. Photo: W. Piasecki

Table 1

Parameters of infestation of *Salvelinus alpinus* L. caught in the Hornsund area in 1986

Parasite	No. of fish infested	Invasion incidence (%)	Invasion intensity	Total no. of parasites	Mean invasion intensity	Mean invasion intensity in population
<i>Eubothrium salvelini</i>	40	90.90	1–132	2023	50.58	45.98
<i>Diphyllbothrium</i> sp.	38	86.36	single – v. numerous	+	+	+
<i>Philonema</i> sp.	5	11.36	1–8	15	3.0	0.34
<i>Nematoda</i> gen sp.	1	2.27	1	1	1.0	0.023
<i>Salmincola edwardsii</i>	4	9.09	1–7	13	3.25	0.29

Invasion incidence = percentage of fish infested

Invasion intensity = minimum and maximum number of parasites in fish

Mean invasion intensity = no. of parasites: no. of fish infested

Mean invasion intensity in population = no. of parasites: no. of fish examined



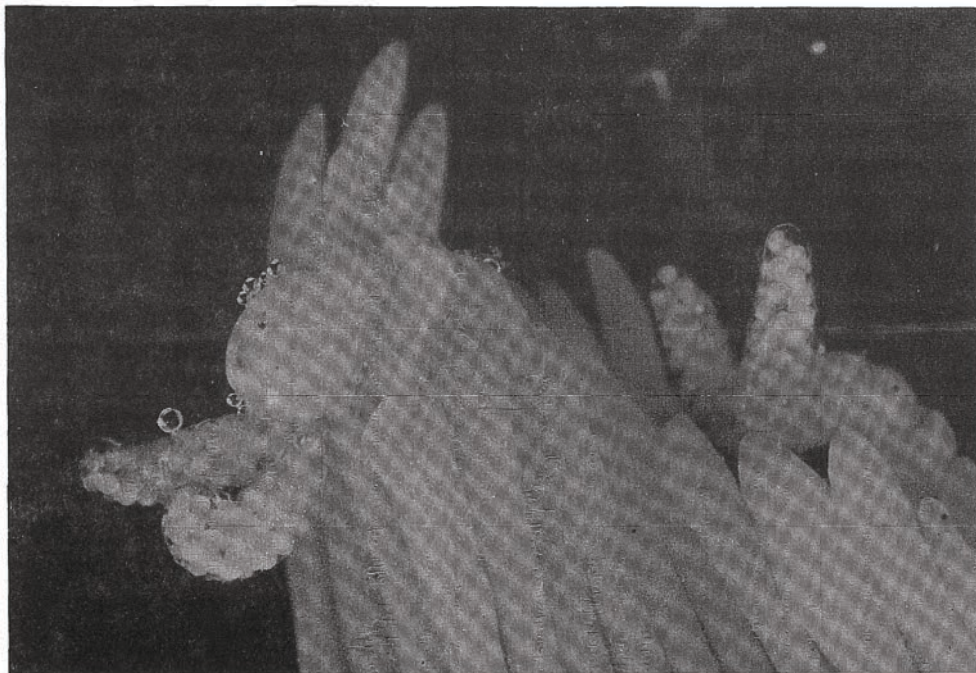


Fig. 4. Female *Salmincola edwardsii* on gills of Arctic charr. Photo: K. Radziun

Gills of three fishes caught in 1986 yielded a total of 13 parasitic crustaceans identified as *Salmincola edwardsii* (Olsson, 1869), from 170 7 parasites being found on a fish. All the specimens found were females with egg sacs (Fig. 4). No male was found.

## DISCUSSION

Due to its common occurrence and wide range, *S. alpinus* had been often subject to parasitologic studies. Comparison of data reported by Byhovski (1962) and Index Catalogue (1983) shows the species to have so far hosted more than 55 parasitic species. This composite picture, however, consists of data collected in many geographic regions, frequently very different in their ecology. On Baffin Island located not far from Spitsbergen, Dick and Belosevic (1981) found 17 species parasitising the local Arctic charr population. Comparison with the data reported in this paper (5 species) points to the necessity of continuing the studies in the Hornsund area. The nature and quality of the study materials seem to be very important. The lack of muscles, skin and/or other organs in some fish specimens examined must have reduced the number of parasitic species found. Moreover, it seems very important that the parasitologic

examination be carried out immediately upon capture, which doubtless would enrich the list of parasites with numerous external parasites, mainly protozoans.

The *Diphyllbothrium* sp. cestodes occurred as larvae. Species identification of pseudophyllid plerocercoids is very difficult, if at all possible without culturing them on subsequent hosts. For this reason, papers reporting names of species and not based on the culture procedure (Butorina, 1975; Dick and Belosevic, 1981) are of a doubtful value.

*Eubothrium salvelini* is a parasite typical of the Arctic charr and has a wide range of occurrence.

The *Philonema* nematodes found which were impossible to identify to species due to their poor condition could have belonged to *Ph. agubernaculum*, recorded in the Arctic charr from Lake Nettilling and River Koukdjuak, Western Lowlands Baffin Island (Dick and Belosevic, 1981).

The copepods found on the gills were representatives of *Salmincola edwardsii*. This is a parasite typical of the genus *Salvelinus*. The wide range of host's occurrence resulted in a practice, common until recently, of describing new copepod species such as *S. exsanguinata* Sandeman et Pipy, 1967 (from New Foundland) and *S. mattheyi* Dedie, 1940. The comprehensive revision of the species by Kabata (1969) allowed to conclude that all those copepods were *S. edwardsii* of a range similar to that of the host.

Continuation of the studies at a larger scale will doubtless facilitate a more comprehensive comparison of the parasitic fauna of the Spitsbergen Arctic charr with parasites of other stocks of the species.

## CONCLUSIONS

1. The materials studied yielded parasites belonging to 5 taxa.
2. Noteworthy is the occurrence, in fish muscles, of the *Diphyllbothrium* cestodes which pose a threat to human health.

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PARAZYTOFAUNA GOLCA *SALVELINUS ALPINUS* (L., 1758)  
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STRESZCZENIE

Przeprowadzono badania parazytofauny 64 osobników *Salvelinus alpinus*, pozyskanych w rejonie Hornsundu (Fig. 1 i 2), w których znaleziono pięć gatunków pasożytów należących do trzech grup systematycznych (Tabela 1).

W ścianach żołądków i pod otrzewną ścienną ryb znaleziono larwy tasiemców należących do rodzaju *Diphyllbothrium* Cobbold, 1858. W większości przewodów pokarmowych badanych ryb występowały tasiemce z gatunku *Eubothrium salvelini* Schrank, 1790 (Fig. 3). W jamie ciała, na gonadach oraz otrzewnej trzewnej kilku ryb znaleziono nicienie z rodzaju *Philonema* Kuitenen-Ekbaum, 1933 oraz jednego nicienia o nieokreślonej przynależności gatunkowej. Na skrzelach golców znaleziono 13 pasożytniczych skorupiaków z gatunku *Salmincola edwardsii* (Olsson, 1869) (Fig. 4). Uzyskane dane pozwoliły określić ekstensywność, intensywność, średnią intensywność oraz średnią intensywność zarażenia populacji badanego gatunku.

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